

High Density Altitude Takeoffs and Landings

An airplane or glider flies on **Indicated Airspeed**—not on groundspeed, true airspeed, or anything else!

At high density altitude (high elevation and/or high air temp) there are fewer air molecules per cubic foot than at sea level. This means that:

- 1) an airfoil has to move faster to create the same forces
- 2) an engine develops less power because there's less of the fuel/air mixture in the cylinder volume (as if flying with a lower throttle setting)
- 3) it takes more power to fly any aircraft (because $\text{power} = \text{drag} \times \text{speed}$)
- 4) takeoff acceleration will be slower and takeoff run will be longer
- 5) it will take a longer time until you have good aileron control
- 6) the climb gradient will be MUCH shallower: it will take much more distance to climb to a given altitude—in particular, to an altitude from which it would be safe to return to the field after a rope break
- 7) turn radius will be greater

How do we recognize it in the cockpit?

- 1) it is hot
- 2) low altimeter setting (below 29.92 or standard day)

What does this mean for us?

- 1) **expect** to have to wait longer before getting good aileron control
- 2) **expect** to take more time/room/speed to lift off
- 3) **expect** a shallow climb gradient under tow
- 4) **expect** a larger turn radius when maneuvering near terrain or when turning final
- 5) **expect** to need more room for on- or off-field landings
- 6) **expect** to lose aileron control while still moving fairly rapidly
- 7) **Expect** a greater risk of groundlooping (more speed/less control)
Roll out straight ahead!

How do you compensate for it?

- 1) If your glider has flaps, expect the need to use them to the fullest for aileron control during takeoff and landing roll.
- 2) Don't try to "horse it off"—simply hold the normal takeoff attitude and your glider will fly when it's ready to fly.
- 3) Give yourself more room around ridges, in the pattern, and during rollout.

- 4) Plan to roll out straight ahead and work to keep your wings off the ground until you've come to a complete stop.
- 5) **DO** your normal recommended adjustment for your indicated approach speed for steady winds and gusts, but **no additional adjustment** for density altitude....your airspeed indicator is affected by density altitude in exactly the same way as your glider is, so there is no need to make adjustments for this! Your glider will stall at the same indicated airspeed as at sea level.